植 物 分 类 学 报 44 (4): 447–453(2006) doi:10.1360/aps040163
Acta Phytotaxonomica Sinica http://www.plantsystematics.com

Three new species of Piperaceae from Thailand

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Abstract Three new species of Piperaceae, *Piper dominantinervium* A. Chaveerach & P. Mokkamul, *P. pilobracteatum* A. Chaveerach & R. Sudmoon from southern Thailand, and *P. phuwuaense* A. Chaveerach & T. Tanee from northeastern Thailand, are described and illustrated. *P. phuwuaense* is considered rare and endemic to Phu Wua Wildlife Sanctuary. Morphological differences between the new species and related taxa are discussed.
Key words *Piper*, *Piper dominantinervium* A. Chaveerach & P. Mokkamul, *Piper phuwuaense* A. Chaveerach & T. Tanee, *Piper pilobracteatum* A. Chaveerach & R. Sudmoon, Piperaceae, new species, Thailand.

The genus *Piper* L. is estimated to contain over 1000 species which are distributed mainly in tropical regions of the world. Several species have great economic and cultural importance and are used as foods, medicines, stimulants, antiseptics and antioxidants. Moreover, their essential oil and leaf extracts possess activities against several bacterium strains and fungi. Leaves of *P. hispidinervum* C. DC. contain a high level of safrole (83%–93%) which is an important raw material for chemical industries. Two derivatives of safrole are heliotropin, which is widely used as a fragrance and flavoring agent, and piperonyl butoxide, which is a vital ingredient of pyretroid insecticides. There are other *Piper* species with possibilities for extracting safrole and can be cultivated in the local communities. Because of the usefulness of many known *Piper* species, this diverse plant group should be studied in more depth to determine more economic and medicinal uses of other species.

We have been concentrating our work on species diversity of this genus in Thailand. Many species have been reported recently (Chaveerach & Picheansoonthon, 2004) and some of these species descriptions are in the process of publication. It is evident that the plant diversity and taxonomy in Thailand have not been completed.

Taxonomic identifications of the three new species described in this paper were investigated based on references available from Baker and Van Den Bakhuizen (1963), Chaveerach et al. (2002), Chaveerach (2003), Chaveerach and Picheansoonthon (2004), Cheng et al. (1999), Chew (1972), Gardner (2003), Hayata (1911), Henderson (1959), Heyne (1987), Ho (1960, 1991), Hooker (1885), Huber (1988), Keng (1990), Lin and Lu (1996), Long (1984), Merrill (1912), Ridley (1967), Royen (1982), and Yuncker (1972). Type specimens were checked from many herbaria. Botanical illustrations of these studied specimens are shown.

1. Piper dominantinervium A. Chaveerach & P. Mokkamul, sp. nov. Fig. 1

Haec species similis *P. diospyrifolio* Kunth, sed a quo differt foliorum laminis oblongis, basi aequalibus vel inaequalibus, apice acuminatis, venis utrinque pilosis, spica mascula conspicue breviore, staminibus 4, bracteis glabris.

Southern Thailand. **Phang Nga**: Sriphang Nga National Park, alt. 100 m, evergreen

Received: 19 April 2005 Accepted: 14 August 2005
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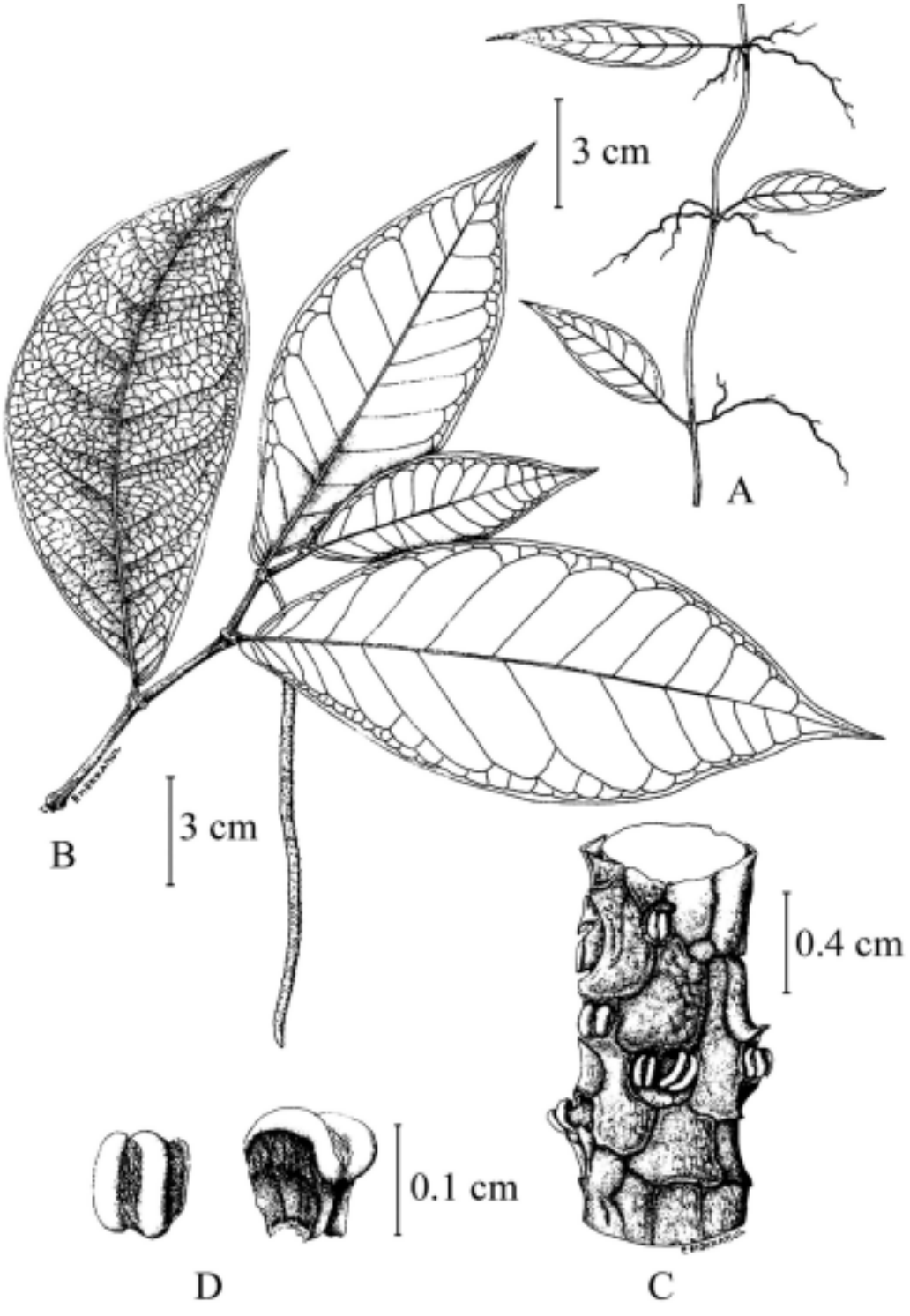

Fig. 1. *Piper dominantinervium* A. Chaveerach & P. Mokkamul. A, leaves toward base of stem; B, leaves toward apex of stem with male spike; C, male spike; D, anthers. Drawn by P. Mokkamul from the type gathering, *A. Chaveerach 63498* (epiphytic branch) and *A. Chaveerach 63499* (flowering branch).

forest, 2000-10-19, A. Chaveerach 63498-500 (holotype, BK; isotype, Department of Biology, Faculty of Science, Khon Kaen University, Thailand). **Ranong**: Ngao Waterfall National Park, alt. 100 m, 2000-10-18, A. Chaveerach 492 (BK); ibid., Poonyaban waterfall, alt. 200 m, 2000-10-18, A. Chaveerach 493 (BK).

Climber on trees, nodes distinctly jointed, swollen, brownish-blackish when dry. Stem stout, furrowed when dry. Leaves toward base of stem coriaceous, oblong to narrowly elliptic, 7.5–9 cm long, 1.5–3.5 cm broad, apex acute, base subcuneate-cuneate or subrounded; petiole 1–1.2 cm long. Leaves toward apex of stem coriaceous, ovate or narrowly elliptic to elliptic, 12–19 cm long, 2.5–9 cm broad, apex cuspidate, base oblique and unequally sided, auriculate, dark green, densely yellowish, brownish or reddish-glandular; petiole 0.1–0.2 cm long. Veins different from most *Piper* species, many, all from midrib at regular intervals of base to apex reaching near margin joining with each other. Male spikes pendulous, 5–13 cm long, ca. 0.3 cm in diameter. Peduncle 0.7–1.5 cm long. Bracts elliptic, sessile, margin ciliate. Stamens 2. Female spikes not seen. Fl. Sept.–Nov.

Piper dominantinervium is similar to *P. diospyrifolium* Kunth in having veins of leaf blade dominant and joining, leaf blade on both upper and lower surfaces glandular, but differs by having leaf blade ovate or narrowly elliptic to elliptic, base oblique and unequally sided, auriculate, apex cuspidate, male spikes 5–13 cm long, stamens 2, bracts margin ciliate.

Notes: The name of this species refers to one of its most dominant morphological characteristics: Its veins are different from most *Piper* species in Thailand, which have basal veins leaving the base and apical veins leaving the midrib. This species has many veins branching from the midrib at regular intervals and the apices of the veins extend near the leaf margin to adjoin with the adjacent veins.

2. Piper phuwuaense A. Chaveerach & T. Tanee, sp. nov. Fig. 2

Haec species insignis foliis basi irregulariter auriculatis, lobo brevi imbricato cum eo longo, bracteis exstipitatis, basi imbricatis, margine ciliatis.

Northeastern Thailand. **Nongkhai**: rare and endemic to Phu Wua Wildlife Sanctuary, alt. 300–400 m, dry evergreen forest, near the border of Thailand and Laos, 2000-11-06, A. Chaveerach 63501-3 (holotype, BK; isotype, Department of Biology, Faculty of Science, Khon Kaen University, Thailand).

Climbers on tree and rocks, glabrous, light green. Stem black, furrowed when dry. Leaves toward base of stem oblong, 7.5–8 cm long, 2.7–3.2 cm broad, apex acuminate, base cordate with equal basal lobes; petiole 0.5–2 cm long. Veins 4 basal and the one prominent pair reaching apex, the other transverse veins from midrib joining the prominent pair. Leaves toward apex of stem obovate, elliptic-oblong, 16–20 cm long, 7.5 cm broad, apex acuminate, cuspidate, base irregularly auriculate, the short one lobe overlapping the other long lobe. Veins 7–8, distinctive, adaxially and abaxially prominent, apical pair rising 1.5–3 cm above base reaching apex, 6–7 basal, other transverse veins near apex from midrib joining the apical pair before leaf margin. Male spikes pendulous, 2–3 cm long, ca. 0.15 cm in diameter. Peduncle 1 cm long. Bracts elliptic, rounded, not stalked, base overlapping, margin ciliate. Stamens 3. Female spikes not seen. Fl. Oct.–Nov.

Piper phuwuaense has very distinctive characters including leaf base irregularly auriculate, the short one lobe overlapping the long one lobe, bracts not stalked, base overlapping, margin ciliate, and hence is not similar to any *Piper* species.

Notes: This species is known only from its type locality, the Phu Wua Wildlife Sanctuary area, growing in the limestone areas of dry evergreen forest. It is a rare and endemic species. The specific epithet refers to the type locality of the species, Phu Wua in northeastern Thailand.

3. Piper pilobracteatum A. Chaveerach & R. Sudmoon, sp. nov. Fig. 3

Haec species similis *P. kawakamii* Hayata, sed a quo differt petiolis glabris, foliorum

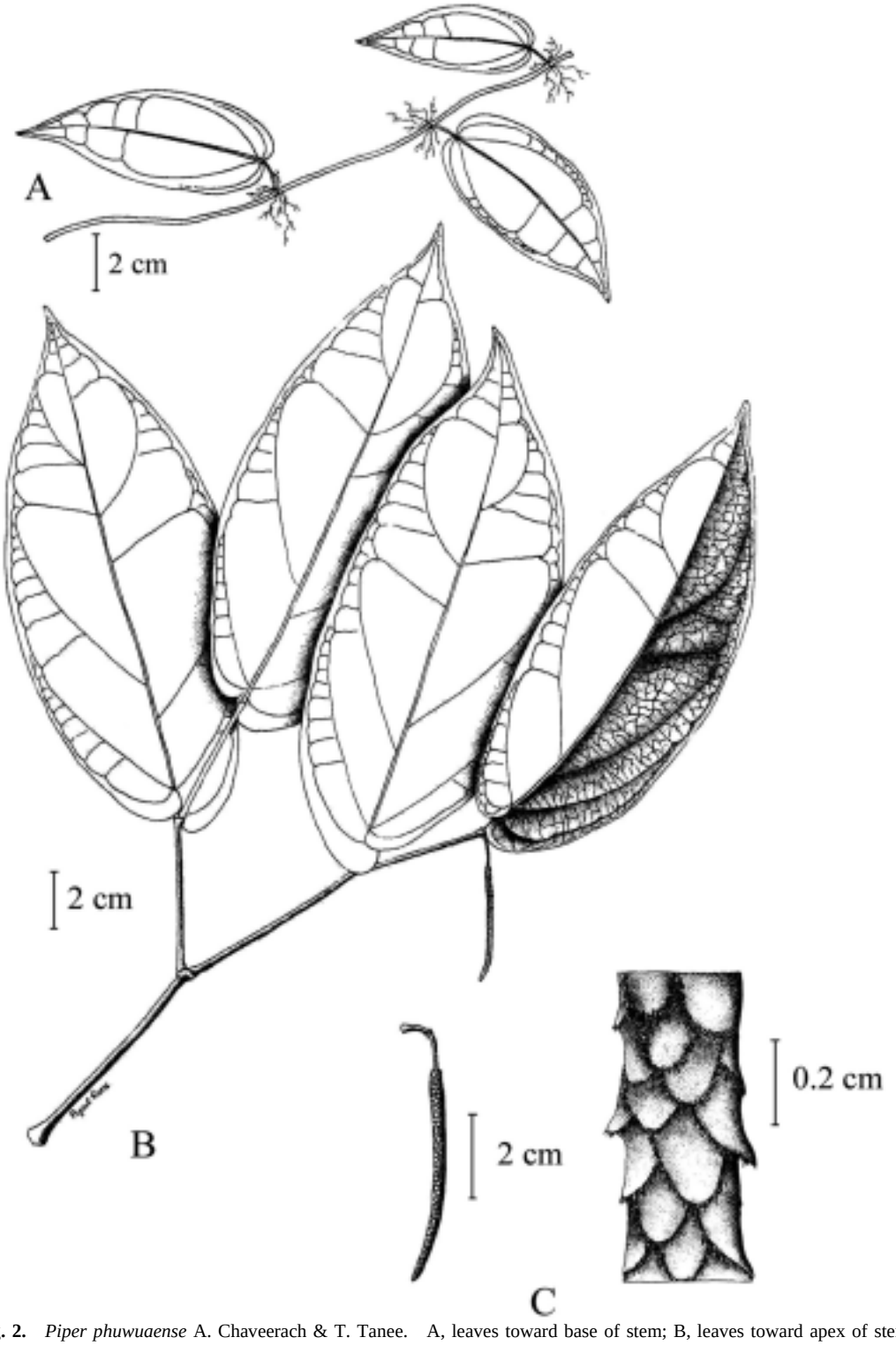

Fig. 2. *Piper phuwuaense* A. Chaveerach & T. Tanee. A, leaves toward base of stem; B, leaves toward apex of stem with male spike; C, male spike. Drawn by P. Mokkamul from the type gathering, *A. Chaveerach 63501* (epiphytic branch) and *A. Chaveerach 63502* (flowering branch).

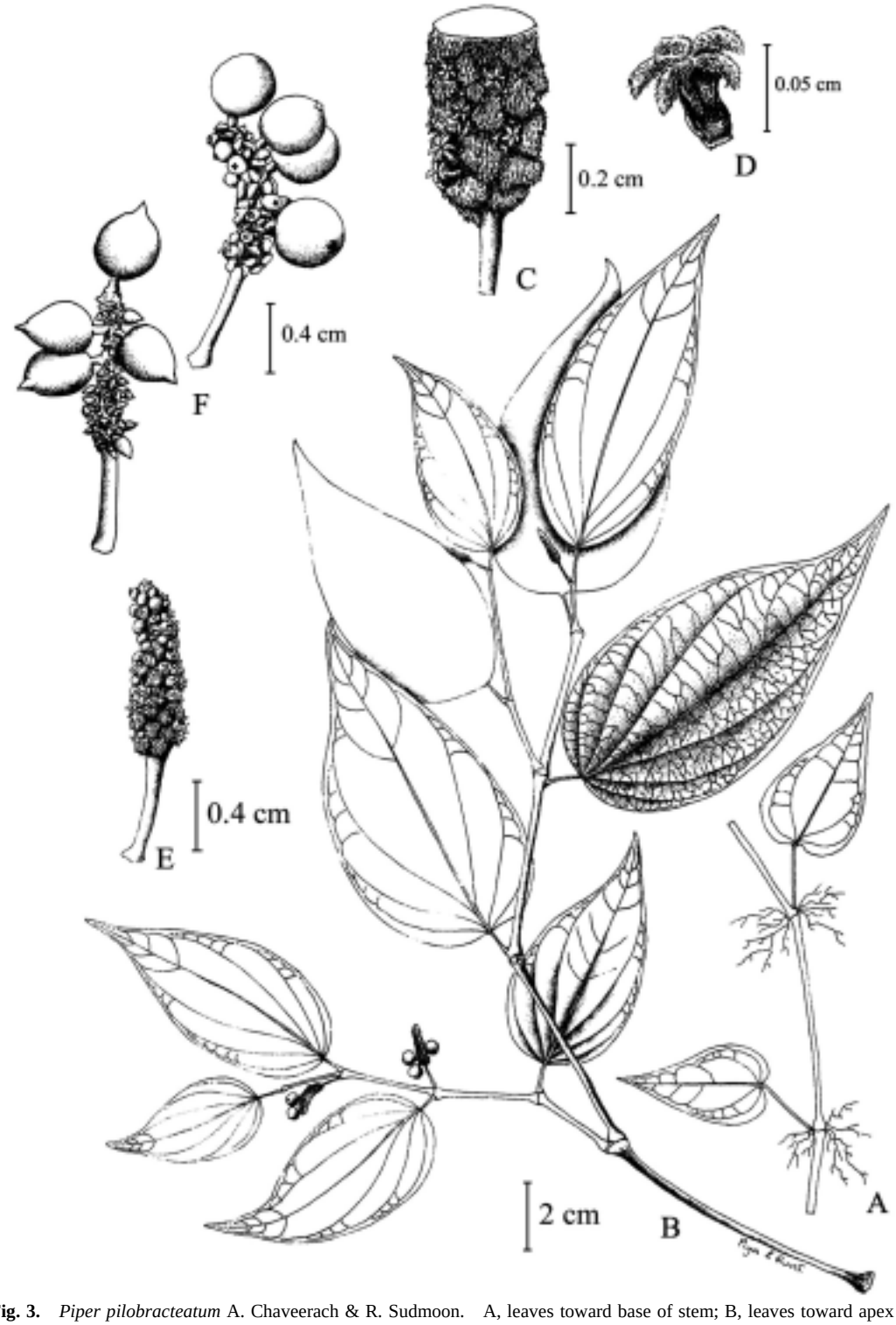

Fig. 3. *Piper pilobracteatum* A. Chaveerach & R. Sudmoon. A, leaves toward base of stem; B, leaves toward apex of stem with fruiting and flowering spikes; C, female spike; D, female flower; E, F, fruiting spikes. Drawn by P. Mokkamul from the type gathering, *A. Chaveerach 320* (epiphytic branch) and *A. Chaveerach 63495* (flowering and fruiting branch).

laminis tenuiter chartaceis, haud undulatis, subtus dense glandulosis, basi rotundatis vel vadose cordatis, venis alternis et attingentibus marginem, 2 apicalibus orientibus a basi 1–2 cm, stigmatis 4 glabris.

Southern Thailand. **Phang Nga**: Sri Phang Nga National Park, alt. 100 m, evergreen forest, 2000-10-19, A. Chaveerach 63495 (holotype, BK; isotype, Department of Biology, Faculty of Science, Khon Kaen University, Thailand). **Nakhon Sri Thammarat**: Khao Luang National Park, alt. 100 m, 2000-08-18, A. Chaveerach 320-321 (BK).

Slender climber, glabrous; stem node dilate, yellow when dry, 2–4 cm in diameter. Leaves in sunlight thick papery and undulate, in sunshade thinner, ovate, 8.5–13 cm long, 4–6.5 cm broad, apex acuminate, base rounded or subcuneate, yellowish-green to green, yellowish to light brown when dry, base of blade sparsely hairy, yellowish or brownish glandular; veins 7, all basal or apical pair arising 0.5 cm above base reaching leaf apex, prominent adaxially, reticulate veins transverse. Petiole 1–1.2 cm long, base sparsely hairy and persistent. Male plants not seen. Female spikes cylindrical, straight up, many blooming in sunlight, 1.5–1.9 cm long, ca. 0.3 cm in diameter. Peduncle 0.8–1 cm long. Bracts circular, peltate, base of stalk hairy, upper surface hairy, central densely so, margin ciliate, rachis densely hairy. Stigmas 4 often 5 on a spike. Fruits rounded in sunlight or with a conical point in sunshade, ca. 0.5 cm in diameter, green, returning to greenish-brown and red when ripe, fruits distant on a spike. Pedicel ca. 0.2 cm long. Fl. and fr. Sept.–Nov.

Piper pilobracteatum is similar to *P. kawakamii* Hayata in leaf blade ovate, papery, leaf base rounded, veins 7, female spike erect, stigmas 4, but differs by having petioles glabrous, leaf blades thinner papery and not undulate, abaxially densely glandular, base rounded or shallowly cordate, veins alternate and reaching leaf margin, apical pair of veins arising 1–2 cm above base, stigmas 4 glabrous.

Notes: The specific epithet refers to the hairy upper surface of bracts.

Acknowledgements We would like to thank Vicente F. Garcia, Ph.D. candidate of Botany, Integrative Biology, University of California, for checking some type specimens and reviewing the manuscript of the paper.

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